

## **SUBMISSION INSTRUCTIONS NO. 1**

### **PROCEDURAL REQUIREMENTS**

**I. GENERAL.** [Part VII, Virginia Solid Waste Management Regulations (VSWMR), 9 VAC 20-80-10]. Provide documents listed in these instructions supporting each solid waste management facility permit application.

**II. NOTICE OF INTENT** [§ 500.B., 9 VAC 20-80-10] The notice of intent consists of the cover letter and the documents required by the Virginia Waste Management Act and the regulations. The notice may be submitted by itself or may accompany Part A permit application as shown in Sec. III. Applications that do not contain the required documentation will not be considered complete and shall not be processed by the Department.

**A. Cover Letter.** [§ 500.B.1., 9 VAC 20-80-10] Submit a letter to the Director describing the desired permit or permit amendment, the precise location of the proposed facility, and the intended use of the facility. Attach area and site location maps.

**B. Disclosure Statement** [§ 500.B.2. and Appendix 7.1, 9 VAC 20-80-10] For an new solid waste management facility permit and for an amendments for non-captive industrial landfills to expand or increase capacity, submit signed and notarized copies of the current disclosure statements required by the Virginia Waste Management Act for each of the key personnel. For the convenience of the applicant, forms shown in Appendix 7.1 may be used.

**C. Certification by the Local Governing Body** [§ 10.1-1408.1.B.9 and R of the Code of Virginia supplemented by 500.B.3., 500.B.4., and Appendix 7.2, 9 VAC 20-80-10].

**1. Local Certification of Permits and Permit Modifications.** An application for a new solid waste management facility permit, or for modification of a permit to allow an existing solid waste management facility to expand or increase capacity, shall contain a signed original of the certification prepared by the locality in which the facility is, or will be, located. The certification shall state that the location and the operation of the proposed facility and/or its proposed modification is consistent with the applicable local or regional solid waste management plan (see § 10.1-1411) and is in accordance with all the local ordinances. To be acceptable, the certification shall not contain any qualifications, conditions or reservations. Alternatively, a certification from the local governing body, where the facility is or will be located, also is acceptable if it indicates

that the local government or solid waste management planning unit (see 9 VAC 20-130) has initiated the process to include the new or expanded facility in a revised solid waste management plan. Inclusion of this local governing body certification is sufficient to allow processing of the application, up to but not including publication of the draft permit or permit amendment for public comment, but does not bind the Director in the determination required in § 10.1-1408.1.D.1 of the Code of Virginia.

**2. Local Certification of Permits-by Rule.** An application for coverage under a permit-by-rule or for modification of coverage under a permit-by-rule is not complete unless it contains a signed original of the certification prepared by the locality in which the facility is or will be located. The certification shall state that the location and operation of the proposed facility and/or its proposed modification is consistent with the solid waste management plan (see § 10.1-1411) and is in accordance with all the local ordinances. To be acceptable, the certification shall not contain any qualifications, conditions or reservations.

**D. Reserve Capacity** [Code of Virginia §1408.1.B.6] The provisions of this section do not apply to applications from one or more political subdivisions for new sanitary landfills or the lateral expansion of existing sanitary landfills that will only accept municipal solid waste generated within those political subdivisions' jurisdiction, or municipal solid waste generated within other political subdivisions pursuant to an inter-jurisdictional agreement. If the applicant is a local governing body who plans to build/operate a local landfill, if the applicant is a solid waste authority, or if the applicant is a local governing body with a solid waste agreement with another local governing body, then the provisions of this section of guidance do not apply.

**1. Advertisement.** Pursuant to Code of Virginia §10.1-1408.1.B.6, the owner of a proposed new or expanded sanitary landfill shall contact all of the localities in the Commonwealth to give notice that a landfill is planned and to give the localities the opportunity to reserve airspace capacity in accordance with the needs outlined in each respective solid waste management plan (Code of Virginia §10.1-1411). The applicant shall either advertise in all of the regional newspapers in Virginia, or contact all Planning District Commissions to ask for assistance, or advertise in the *Virginia Review*. The *Virginia Review* is published bi-monthly. The applicant shall also perform a mass mailing and may use the attached form-letter (Appendix 1-1 of this guidance). If a locality responds to an advertisement, the applicant should send a notification letter similar to the attached guidance letter (Appendix 1-2). Each locality shall either sign an agreement to reserve capacity or sign the statement indicating it has declined the offer. Failure to respond to the applicant's request within 60 days from the date on the request will constitute implicit refusal of the offer by the facility.

**2. Submission.** The applicant shall submit to the Department a copy of the advertisements identifying where the notices were advertised, a list of the names and address of localities or planning district commissions it contacted, offer letters, and response letters, if any, and a Certification Statement. **This information shall be submitted as an addendum to the Part A application.** Failure to submit the required documents will preclude the processing of the Part A application. For the convenience of the applicant, sample notification letters and certifications are provided in Appendices 1-1, 1-2, 1-3, and 1-4.

**E. Transportation Report.** In accordance with Code of Virginia § 10.1-1408.4.A.1., an application for a new sanitary landfill shall include a written site-specific report prepared by the Virginia Department of Transportation evaluating the adequacy of the transportation facilities that will be available to serve the landfill, including the impact of the landfill on local traffic volume, road congestion, and highway safety. This document shall be requested from VDOT by the applicant and provided with the Part A Permit application for review. The applicant shall contact the State Traffic Engineer at VDOT (804) 786-6777 for further details. Please note that this requirement can be addressed by the same study and report set forth by Section 10.1-1408.1.D.1 of the Code of Virginia.

**III. PART A APPLICATION.** [§§ 500.C. and 510., 9 VAC 20-80-10] Provide four copies of information essential for the assessment of site suitability for intended uses. As a minimum, include the following information:

**A. Application Form.** [§ 510.A. and Appendix 7.3, 9 VAC 20-80-10] Append to the application letter a fully completed Part A Application Form, as provided in Appendix 7.3. Mark entries that do not pertain to the type of the permit being applied for with "N/A" rather than leaving them blank. Cross-reference the statements about the siting criteria (Section II of the Form) to the documents and maps attached to the form.

**B. Permit Application Fee** [§ 60., 9 VAC 20-90-10]. Submit a check for the required permit application fee in accordance with the Solid Waste Management Facility Permit Application Fee Regulation (9 VAC 20-90-10 ). Applications not accompanied by the proper fee or containing insufficient fees will not be considered complete and shall not be processed by the Department

**C. Host Agreements** [Code of Virginia 10.1-1408.1.B] This section applies to sanitary landfills only.

**1. Private Facilities.** Applications for new sanitary landfill permits must contain a signed certification prepared by the local governing body where the landfill is located, which clearly states that a host agreement has been reached between the applicant and the governing body. If the governing body or a public service authority of which the governing body is a member would be the owner and operator of the landfill such a statement is not necessary, and the facility must provide the information stated in C.2 for locality owned and operated facilities. To be acceptable, the certification shall not contain any qualifications, conditions, or reservations. The certification shall also identify:

- The amount of financial compensation the applicant will provide the locality;
- The daily travel routes and traffic volumes;
- Daily disposal limits;
- Provisions to pay the complete costs of at least one full time employee of the locality to monitor transportation and operation of the landfill; and
- provide assurances that the applicant shall, when requested by the host locality, split air and water samples so that the host locality may independently test the sample, with all associated costs paid for by the applicant with all sampling results provided to the Department.

"Host Agreement" means any lease, contract, agreement or land use permit entered into or issued by the locality in which the landfill is situated which includes terms or conditions governing the operation of the landfill. An example of an acceptable certification is provided in Appendix 1-9 to this guidance.

**2. Locality Owned and Operated Facilities.** If the application is for a locality-owned and locality-operated sanitary landfill or for an expansion of an existing sanitary landfill, information will be provided on the following:

- Anticipated daily travel routes and traffic volumes;
- Anticipated daily disposal limit; and
- Anticipated service area of the facility shall be provided in the Part A application.

## **D. Maps**

**1. Key Map.** [§ 510.B., 9 VAC 20-80-10] Attach to the application one or more key maps delineating the general location of the proposed facility. Plot key map on a latest revision of the 7 1/2-minute USGS topographical quadrangle. Include on the key map the name of the quadrangle and show all important features within one mile from the perimeter of the proposed facility boundary.

**2. Regional Map.** [Code of Virginia Section 10.1-1408.4.B.3] This section applies to sanitary landfills. Facilities accepting municipal solid waste must attach to the application, a map which delineates the following features within five (5) miles of the perimeter of the proposed facility boundary:

- Airports
- Existing surface or groundwater public water intakes or reservoirs
- Any impounding structures (dams)
- Sinkholes or other features associated with karst terrain.

**3. Near-Vicinity Maps.** [§ 510.B., 9 VAC 20-80-10] Attach to the application a map delineating an area of 500 feet from the perimeter of the facility boundary of the proposed facility drawn to a minimum scale of 1" = 200'. The near-vicinity map shall depict the following:

- All homes, buildings or structures including the layout of the buildings which will comprise the proposed facility;
- The facility boundary, the waste management unit boundary, and the unit boundaries for the proposed facility;
- Lots and blocks from the tax map for the proposed facility and all adjacent properties;
- The base floodplain or a note indicating the expected flood occurrence period for the area; include the source of data (Federal Insurance Administration Map) or calculations.
- Existing land uses and zoning classifications;
- All water supply wells, springs or intakes, both private and public;
- In case of the energy recovery facilities, the prevailing wind rose;
- All utility lines, pipelines or land-based facilities (e.g., mines or wells); and
- All parks, recreation areas, surface water bodies, dams, historical areas, wetlands, monuments, cemeteries, wildlife refuges, unique natural areas, or similar features.

**E. Proof of Ownership (Legal Control).** [§ 510.D., 9 VAC 20-80-10] Except in the case that the applicant is a local governing body or a regional authority possessing a power of eminent domain, submit a copy of deed (showing page and book location), lease or other certification of ownership of site. By regulation, the Department cannot accept an application from any person who cannot demonstrate legal control. An option to purchase

is a temporary substitute, but a deed must be provided before construction (before a permit/amendment to construct is issued).

**F. Locational Requirements** [ §§ 180.B., and 250.A., 260.A., 270.A., 330.B., 340.B., 360.B., 370.B., 400.B., or 470.B., 9 VAC 20-80-10]. Solid waste management facilities must be properly located to ensure that their performance will not lead to releases to the environment or disruptions of natural functions, or to keep the unit from areas where the public and sensitive natural environments may be adversely affected. Part A application shall describe how the locational standards will be met and shall be supported by the necessary maps required by Section D. Additional location requirements for new sanitary landfills are contained in Section L of this guidance.

**1. Airports** [ §§ 180.B.8.c. and 250.A.1., 9 VAC 20-80-10]. Facilities that manage putrescible wastes within 10,000 feet of any airport runway used by turbojet aircraft or within 5,000 feet of any airport runway used by only piston-type aircraft as long as the airport is open to the public without prior permission for use and use of available facilities is not restricted. If the above conditions are present, the owner or operator must demonstrate that the facility location and operation will not pose a bird hazard to aircraft. In addition to these requirements, Public Law No. 106-181 prohibits the construction of MSW landfills within 6 miles of airports that have received public funds under chapter 471 and are primarily served by general aviation aircraft and regularly scheduled flights of aircraft designed for 60 passengers or less. The state aviation agency can request exemption to this requirement if the administrator determines that such an exemption will have no adverse impact on aviation safety.

**a. Demonstration** [ § 250.A.1.a., 9 VAC 20-80-10]. A demonstration that a facility does not pose a bird hazard to aircraft within specified distances of an airport runway should address at least three elements of the regulation. A negative response to any one of the following elements constitutes an adequate demonstration.

**(1) Distance.** The first element can be addressed using existing maps showing the relationship of existing runways at the airport to the existing or proposed new unit or lateral expansion. Topographic maps (USGS 15-minute series) or state, regional, or local government agency maps providing similar or better accuracy that would allow direct, scaling or measurement, of the closest distance from the end of a runway to the nearest unit. The measurement should not be made between property or other boundaries except the end of the runway and the nearest waste management unit boundary.

**(2) Public Use.** The regulatory requirement for setback from an airport does not apply to private airfields. Whether the airport is a public-use facility should be readily determined by contacting the airport administration, Virginia Department of Aviation, or the regional FAA office. A copy of the determination shall be included in the application.

**3) Increased Bird Hazard.** The facility design features and operational practices can have a significant effect on the likelihood of increased bird/aircraft collisions. Birds may be attracted to the facility to satisfy a need for water, food, nesting, or roosting. To be successful, the demonstration must describe the waste management techniques to reduce the supply of food to the birds. One or more of the following methods may be used:

**(a) Frequent covering of wastes that provide a source of food.** The application shall include the description of volume and type of wastes, waste delivery schedules, size of the working face, and frequency of cover applied to keep the working face small. By maintaining a small working face, spreading and compaction equipment are also concentrated in a small area which further disrupts scavenging by the birds.

**(b) Shredding, milling, or baling the food-containing waste.** The applicant may elect to mill, shred, or bale the food-containing waste making the waste no longer attractive to birds.

**(c) Other Methods.** The applicant may include other methods with limited long-term effect such as visual or sound deterrents, physical barriers such as fine wires, and firearms. Some of these methods may concentrate on the denial of nesting areas.

**(4) Estimation of Likelihood of Increased Risk.** In addition to design features and operational procedures to control bird populations, the demonstration should also address the likelihood that the disposal unit will increase bird/aircraft collisions and result in damage to the aircraft or injury to its occupants. One approach to addressing this portion of the airport safety criteria is to evaluate the attraction of birds to the unit and determine whether this increased population would be expected to result in a discernable increase in bird/aircraft collisions. The evaluation of bird attraction can be based on field observations at existing facilities where similar design features and operational procedures are used. All observations, measurements, data, calculations and analyses, and evaluations shall

be documented and included in the demonstration.

**b. Notification** [§ 250.A.1.b., 9 VAC 20-80-10]. Owners or operators of sanitary landfills proposing to site new units or lateral units within five miles of any airport runway end must notify both the affected airport and the FAA.<sup>5</sup> This requirement is based on the FAA's position that MSWLFs located within a five mile radius of any airport runway end and which attract or sustain hazardous bird movements across aircraft flight paths and runways, will be considered inconsistent with safe flight operations and notification to the appropriate regional FAA office will allow FAA review of the proposal. If applicable, a copy of the notification must be included in the Part A application.

**2. Floodplains** [ §§ 180.B.1., and 250.A.2., 260.A.1., 270.A.1., 330.B.1., 340.B.2., 360.B.2., 370.B.2., or 400.B.2., 9 VAC 20-80-10]. Except for new sanitary landfills, the regulations do not prohibit locating a disposal facility in a 100-year floodplain if the owner or operator can demonstrate that the unit will comply with the flow restriction, temporary storage, and washout provisions of the regulation. A facility that affects the flow and temporary storage capacity of the floodplain may be acceptable, unless the effect is large enough to cause higher flood levels and greater flood damage downstream with potential hazard to human health and safety. Compliance with the floodplain criteria begins with a determination of whether the facility is located in the 100-year floodplain. In case of the disposal facilities, if the unit is located in the 100-year floodplain, then the owner or operator must demonstrate that the facility will not:

- Restrict the flow of the 100-year flood;
- Reduce temporary water storage capacity of the flood plain(if the base flood level would not be raised by more than one foot then it would be an indication that these two points are met); or
- Result in washout of solid waste that may pose a hazard to human health and the environment.

**a. Floodplain Identification.** The 100-year floodplain, which represents the sedimentary deposits formed by floods that have a one percent or greater chance of occurrence in any given year, or a magnitude equaled or exceeded once in 100 years, are identified in the flood insurance rate maps (FIRMs) and flood boundary and floodway maps published by the Federal Emergency Management Agency (FEMA).<sup>6</sup> Areas not covered by the FIRMs or floodway maps may be included in floodplain maps available

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<sup>5</sup> Federal Aviation Administration (FAA) Order 5200.5A

<sup>6</sup> Guidance on using FIRMs is provided in "How to Read a Flood Insurance Rate Map" published by FEMA.



through the Army Corps of Engineers, the U.S. Geologic Survey, the U.S. Soil Conservation Service, the Bureau of Land Management, the Tennessee Valley Authority, and State and local agencies. Because many of the river channels covered by these maps may have undergone modification for hydropower or flood control projects, the floodplain boundaries represented may not be accurate or representative. The applicant shall compare the floodplain map to recent air photographs to identify current river channel modifications and land use watersheds that could affect floodplain designations and shall discuss the results of the comparison. If floodplain maps are not available, and the facility might be located within a floodplain, then the applicant shall perform a field study to delineate the 100-year floodplain. A floodplain delineation program shall be based primarily on meteorological records and physiographic information such as existing and planned watershed land use, topography, soils and geologic mapping, and air photo interpretation of geomorphologic features.<sup>7</sup> The results of the field study shall be discussed in Part A application.

**b. Engineering Considerations.** A sanitary landfill cannot be located within a 100 year floodplain [10.1-1408.4.B.1] If a CDD or industrial landfill is within the 100-year floodplain, it must be located so that the unit does not significantly restrict the base flood flow or significantly reduce temporary storage capacity of the floodplain. Furthermore, the landfill must be designed to prevent the washout of solid waste during the expected flood event. The applicant shall demonstrate that these considerations will be met based on estimates of the flow velocity and volume of floodplain storage in the vicinity of the disposal unit during the base flood. The assessment should consider the floodplain storage capacity and floodwater velocities that would likely exist in absence of the unit. The volume occupied by a unit in a floodplain may alter the storage capacity and restrict flow. An alteration which raises the base flood level by more than one foot indicates that the unit will significantly reduce and restrict storage capacity flow. The location of the unit relative to the velocity distribution of floodwaters will greatly influence the susceptibility to washout. This type of assessment will require a conservative estimate of the shear stress on the landfill components caused by the depth, velocity, and duration of impinging river waters. Depending on the amount of inundation, the landfill may act as a channel side slope or bank or it may be isolated as an island within the overbank river channel. In both cases an estimate of the river velocity would be part of a proper assessment. The Army Corps of Engineers<sup>8</sup> has developed several numerical models to aid in the prediction of flood hydrographs, flow parameters, the effect of obstructions on flow levels, the simulation of flood control structures, and sediment transport.

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<sup>7</sup> U.S. Water Resources Council, "Guidelines for Determining Flood Flow Frequency"; Bulletin #17A of the Hydrology Committee; revised June 1977.

<sup>8</sup> COE, *HEC-1, HEC-2, HEC-5, HEC-6 Computer Programs*; Hydrologic Engineering Center (HEC); U.S. Army Corps of Engineers; Davis, California (1982).

**3. Unstable Areas** [§ 250.A.3., 260.A.2., 270.A.2., or 330.B.2., 9 VAC 20-80-10]. The application shall include a detailed geotechnical and geological evaluation designed to assess the subsurface under natural and human-induced conditions. The assessment of whether the subsurface can support the unit adequately without damage to the structural components shall address:

- Poor foundation conditions that may result in inadequate support for structural components of the unit such as old fill areas, expansive soils and soils subject to rapid settlement;
- Areas susceptible to mass movement where down slope movement of soil, rock, (alone or mixed with water) and/or debris can occur under the influence of gravity; or
- Areas underlain by soluble bedrock, that have a potential to develop karst terrain. These areas may contain extensive subterranean drainage systems and relatively large subsurface voids that can lead to sinkhole development.

If the assessment shows that the proposed unit will be located in an unstable area, the applicant may choose to provide assurances that engineering measures will be incorporated into the design of the unit to ensure that the integrity of the structural components of the unit will not be disrupted.

**4. Wetlands** [§ 250.A.4., 260.A.6., or 270.A.5., 9 VAC 20-80-10]. For sanitary landfills, the Code of Virginia §10.1-1408.4 B 2 prohibits the construction of a new landfill that would be sited in any tidal wetland or nontidal wetland contiguous to a surface water body. §1408.5.A further addresses the siting of new sanitary landfills or expansions of sanitary landfills in wetlands. The term “wetlands” as applied in §10.1-1408.5 E is any tidal wetland or nontidal wetland contiguous to a tidal wetland or surface water body. The siting requirements for new and expanded sanitary landfills with respect to wetlands are discussed further in Section III.K.2 of this guidance.

For other facilities, a Part A application shall contain either a statement that the proposed disposal units will not be located in a wetland or contain a demonstration that alternate sites are not available and that impact to wetlands is therefore unavoidable.

**a. General.** The wetland location restrictions are applicable to all new CDD and industrial landfill units and lateral expansions and require owners and operators of such units to meet the demonstration requirements prior to construction. The location restrictions allow existing disposal units located in wetlands to continue operations as long as compliance with the other requirements of the Virginia Solid Waste Management Regulations can be maintained. In the demonstration that locating CDD or industrial landfill unit in a wetland is unavoidable, the applicant shall address the following key issues:

- Compliance with other laws;

- Practicable alternatives;
- Evaluation of wetland acreage and function;
- Minimization of impact;
- Mitigation of impact; and
- Wetland offset.

**b. Compliance with Other Laws.** Locating or laterally expanding a CDD or industrial landfill in wetlands or impact of a SLF to wetlands of less than 2 acres as allowed under the provisions of §10.1-1408.5, requires compliance with other environmental regulations. The owner or operator must show that operation or construction of the landfill will not:

- Violate any applicable State water quality standards;
- Cause or contribute to violation of any applicable toxic effluent standard or prohibition;
- Cause or contribute to violation of any requirement for the protection of a marine sanctuary; or
- Jeopardize the continued existence of endangered or threatened species or critical habitats.

In addition to the Virginia Solid Waste Management Regulations, other federal and Virginia requirements may be applicable in siting a landfill in a wetland. These include:

- Sections 401, 402, and 404 of the CWA;
- Tidal Wetlands Act of 1972 and Chapters 12 and 13 of Title 28.2 of the Code of Virginia
- Virginia Administrative Code 9 VAC 25-210, Virginia Water Protection Permit (VWPP)
- Chesapeake Bay Preservation Act 10.1-2100 et seq. and Chesapeake Bay Preservation Area Designation and Management Regulations 9 VAC 10-20-10 et seq.
- Rivers and Harbors Act of 1989;
- Executive Order 11990, Protection of Wetlands;
- National Environmental Policy Act;
- Migratory Bird Conservation Act;
- Fish and Wildlife Coordination Act;
- Coastal Zone Management Act;
- Wild and Scenic Rivers Act, and

- National Historic Preservation Act.

The impact of wetlands and/or streams for construction of a solid waste disposal facility will require a permit from the Army Corps of Engineers (COE), which oversees jurisdictional wetlands under authority of the EPA, and DEQ VWP program, which has separate authority over impacts to wetlands and/or stream. Virginia Marine Resource Commission (VMRC) involvement may also be required

## **G. SANITARY LANDFILL IMPACT STATEMENTS (LIS) [Code of Virginia §10.1-1408.4.A.2 and §10.1-1408.4.B.6]**

**1. General.** Pursuant to the requirements of Code of Virginia, §§10.1-1408.4.A.2 and B.6, the applicant shall prepare a report discussing the environmental impact of the proposed sanitary landfill on parks and recreational areas, wildlife management areas, critical habitat areas of endangered species as designated by applicable local, state, or federal agencies, public water supplies, marine resources, wetlands, historic sites, fish and wildlife, water quality, and tourism. The required report shall be referred to a Landfill Impact Statement (LIS). It is similar to but not the same as an Environmental Impact Statement (EIS) required by 40 CFR Part 6. The applicant shall contact the appropriate state and federal agencies to request their opinion on the impact of the landfill in the areas listed above. The applicant shall provide all necessary documentation and maps to these agencies. The applicant shall provide to the Department a comprehensive report of the findings of the agencies and its own consultants. The impact statement shall consider landfill siting and configuration alternatives and will discuss the reasons why each alternative is/is not feasible. Impacts and any potential solutions to each impact will be discussed. The report will be an Appendix to the Part A submittal and must be a stand-alone document.

**2. Format.** The format used for LIS's shall encourage clear analysis and presentation of alternatives including the proposed action, and their environmental, economic and social impacts. The following standard format for LIS's should be used:

- a. Cover sheet;
- b. Executive Summary;
- c. Table of contents;
- d. Purpose of and need for action;
- e. Alternatives including the selected alternative;
- f. Affected environment;
  - Parks and recreational areas

- Wildlife management areas (Critical habitat areas of endangered species as designated by applicable local, state, or federal agencies)
- Public water supplies
- Marine resources
- Wetlands
- Historic sites
- Fish and wildlife
- Water quality
- Tourism

**g.** Environmental consequences of the alternatives;

**h.** Coordination (includes list of agencies, organizations, and persons to whom requests were made and copies sent);

**i.** List of consultants having contributed to the preparation of the LIS;

**j.** Index (commensurate with complexity of the LIS); and

**k.** Appendices.

#### **H. Hydrogeologic and Geotechnical Report.** [9 VAC 20-80-510.E., 9 VAC 20-80-10 ]

For facilities regulated under Part V of the Virginia Solid Waste Management Regulations, (9 VAC 20-80-10 et seq), submit a hydrologic and geotechnical report signed by a professional geologist or engineer registered for practice in the Commonwealth. The report shall include, as a minimum, the following:

**1. Purpose and Methods.** The purpose of the report is to accomplish two tasks: 1) definition of the geology beneath the site area and 2) identification of the groundwater flow paths and rates. Appendix 1-5 shows a variety of investigatory techniques are available to achieve these goals. Those techniques that the applicant shall use in the preparation of the report are identified with check marks.

**2. Boring Records.** [9 VAC 20-80-510.E.1., 9 VAC 20-80-10 ] Include in the report the records and analyses from an adequate number of properly spaced borings. The borings shall identify the uppermost aquifer under the proposed facility and determine the ability to perform groundwater monitoring.

**a. Number of Borings.** [9 VAC 20-80-510.E.1.a, 9 VAC 20-80-10 ] The number of initial borings; shall be at a minimum in accordance with Table 7-1.OF 9 VAC 20-80-

10, unless the results of preliminary work demonstrated that a different number is adequate to characterize the site. Support the number of borings chosen by the discussion of factors listed in the Appendix 1-6. Additional boreholes may be installed in numbers sufficient to characterize the geology beneath the site.

**b. Locations of Borings.** [9 VAC 20-80-510.E.1.d., 9 VAC 20-80-10 ] The boring pattern shall enable the development of detailed cross-sections through each solid waste management unit to sufficiently characterize the site geology.

**c. Depth of borings** [9 VAC 20-80-510] Each boring shall be advanced a minimum of 20 feet below base grade unless the area is being investigated for potential solution caverns. If a facility is being investigated for solution caverns, all boring shall be advanced a minimum of 100 feet below base grade and continuous rock core shall be collected.

**d. Sampling.** [9 VAC 20-80-510.E.1.e, 9 VAC 20-80-10 ] The report shall contain subsurface data obtained from properly collected samples. Samples shall be collected at every significant stratigraphic contact and formation, especially the confining layer. Continuous cores are necessary to ascertain initially the presence and distribution of small- and large-scale permeable layers and the presence or absence of solution caverns. Samples taken at 5-foot intervals may be substituted for continuous cores once stratigraphic control is established unless the purpose is to evaluate the potential existence of solution caverns.

**e. Boring Logs.** [9 VAC 20-80-510.E.2.a, 9 VAC 20-80-10 ] The report shall contain field and final logs for each boring. Appendix 1-7 shows the required information.

**f. Observation Wells.** [9 VAC 20-80-510.E.1.g., 9 VAC 20-80-10 ] The report shall identify the borings converted to water level observation wells, well nests, piezometers, or piezometer nests.

**g. Hydraulic Conductivity.** [9 VAC 20-80-510.E.1.h, 9 VAC 20-80-10 ] Describe the methods and the results of the field tests for the determination of the in-situ hydraulic conductivity of the uppermost aquifer.

**h. Sealing of Borings.** [9 VAC 20-80-510.E.1.i, 9 VAC 20-80-10 ] The report shall contain a statement certifying that all borings not converted to permanent monitoring

wells have been properly sealed with material at least an order of magnitude less permeable than surrounding material to reduce the number of potential pathways.

**3. Description of Soil Units.** [9 VAC 20-80-510.E.2., 9 VAC 20-80-10 ] The report shall contain a complete description of the soil units and the results of the permeability testing to include corroborating and supporting data. At a minimum, submit the following data: 1) evidence that the facility will not be sited in geologically unstable areas [9 VAC 20-80-250.A.3., 260.A.2., 270.A.2., or 340.B.2., 9 VAC 20-80-10 ]; 2) evidence that the facility will not be located in the wetlands [9 VAC 20-80-250.A.4., 260.A.6., 270.A.5., or 340.Be, 9 VAC 20-80-10 ], 3) in-situ permeability data showing the test method, calculations, natural moisture, Atterberg limits, natural unit weight, method of sampling, and other related test results; and 4) remolded permeability data using Proctor compaction test (ASTM D-698).

Perform sufficient laboratory analyses to provide information concerning petrologic variation, sorting (for unconsolidated sedimentary units), cementation (for consolidated sedimentary units), moisture content, and hydraulic conductivity of each significant geologic unit or soil zone above the confining layer. Perform sufficient laboratory analyses to describe the mineralogy, degree of compaction, moisture content, and other pertinent characteristics of any clays or other fine-grained sediments identified as the confining layer. Appendix 1-8 shows a list of suggested laboratory methods.

**4. Water Table Information.** [9 VAC 20-80-250.A.8., 260.A.7., or 270.A.6., and 340.E.2.c, 9 VAC 20-80-10 ] The report shall contain data and calculations giving hydrogeologic information on the water table elevations, and direction and estimated rate of groundwater flow. The applicant shall furnish evidence that the facility will be located in an area where groundwater monitoring can be conducted.

**a. Groundwater Level Measurements.** To determine the elevation of the potentiometric surface in any monitoring well or piezometer, address the following criteria in the report: 1) an accuracy of 0.01 foot in the casing height as measured by a licensed surveyor; 2) water level measurements from boreholes, piezometers, or monitoring wells used to construct a single potentiometric surface should have been collected within a 24-hour period (the latter period should be shortened in tidally influenced aquifers, aquifers affected by river stage, and aquifers stressed by intermittent pumping); 3) the method used to measure water levels should have been adequate to attain an accuracy of 0.01 foot; 4) location of the survey mark; 5) water levels in piezometers should have been allowed to stabilize for a minimum of 24 hours after well construction and development prior to measurement.

**b. Vertical Flow Components.** To determine the direction of flow, measure directly vertical components of groundwater flow using piezometers installed in clusters. To obtain reliable measurements, observe the following criteria in the placement of clusters:

- Information obtained from multiple piezometer placement in single boreholes may generate erroneous data. Placement of vertically nested piezometers in closely spaced separate boreholes is the preferred method.
- Determine piezometer measurements along a minimum of two vertical profiles across the site. These profiles should be cross sections roughly parallel to the direction of flow indicated by the potentiometric surface.
- Collect piezometer measurements at least within a 24-hour period and within shorter intervals under certain conditions as noted in 4a. above.

**c. Seasonal and Temporal Factors.** The report should include an assessment of factors that may result in short- and long-term variations in groundwater level and flow patterns. Such factors that may influence groundwater conditions include:

- Off-site well pumping, recharges, and discharges;
- Tidal processes or other intermittent natural variations (e.g., river stage);
- On-site well pumping; and
- Off-site and on-site construction or changing land use patterns.

**d. Hydraulic Conductivities.** The report should contain a discussion of the distribution of hydraulic conductivity values within each significant formation or aquifer regime. Because anisotropy within strata affects the magnitude and direction of flow, this information is necessary before the applicant can make decisions about well placement. Hydraulic conductivity can be determined in the field using either single or multiple well tests with the latter being preferred.



**5. Aquifer Description.** The report shall contain a description and a catalog of aquifers and geological features that might affect the operation of the facility. Proper identification of the uppermost aquifer is essential to establishing a proper groundwater monitoring system. The identification of the confining layer or lower boundary is an important part of the definition of the uppermost aquifer. There should be little interconnection based on the pumping tests between that aquifer and the lower aquifers. The report should identify saturated zones such as low permeability clay, acting as pathways for contamination and causing migration for some distance before reaching a zone that yields a significant amount of water.

**6. Maps and Diagrams.** The report shall contain:

**a. Geologic Maps.** [9 VAC 20-80-510.E.2c(4), 9 VAC 20-80-10 ] Geologic maps of the proposed area based on the borings and literature review at a scale of 1" = 200' showing ground surface contours, various geologic formations locations of the uppermost aquifer and aquifer hydraulically interconnected beneath the facility and, if present, the extent of the plume of contamination that has entered the groundwater from existing units;

**b. Cross Sections.** [9 VAC 20-80-510.E.2.c(5), 9 VAC 20-80-10 ] Detailed cross sections depicting significant geologic or structural trends identified on the geologic maps and reflecting features in relation to local and regional groundwater flow; on each cross section show petrography of significant formations, significant structural features, stratigraphic contacts between formations, zones of high permeability or fracture, the location of each borehole, depth of termination, depth to the zone of saturation, and depiction of any geophysical logs; and

**c. Potentiometric Maps and Flow Nets.** [9 VAC 20-80-510.E.2.c(6)., 9 VAC 20-80-10 ] Definition of the groundwater conditions shall be based on stabilized elevations. In constructing a potentiometric surface map the applicant should have used raw data from piezometers or wells screened at equivalent stratigraphic horizons. Information obtained from the piezometer cluster readings shall be used to construct flow nets in addition to surface maps.

**I. Description of Site Geology.** [9 VAC 20-80-510.F., 9 VAC 20-80-10 ] For facilities regulated under Part VI of the Virginia Solid Waste Management Regulations (9 VAC 20-80-10 et seq), furnish a description and a catalog of aquifers and geological features that might affect the operation of the facility. Composting facilities shall also submit evidence required under item III.F. above if applicable. Furnish a copy of a geologic

map or report if it is available in published literature.

**J. Notification Statement.** [9 VAC 20-80-510.G., 9 VAC 20-80-10 ]

Attach a signed statement by the applicant that he has sent a written notice to the adjacent property owners or occupants.

**K. OTHER PROHIBITIONS FOR SITING OF NEW SANITARY LANDFILLS**

In accordance with Code of Virginia Section 10.1-1408.4, no new sanitary landfills shall be constructed : 1) in a 100-year floodplain, 2) in any tidal or non-tidal wetland contiguous to any surface water body, 3) within 5 miles up-gradient of any existing surface water or groundwater public water supply intake or reservoir, 4) in any area vulnerable to flooding from dam failures, 5) over a sinkhole or less than 100 feet above a solution cavern associated with karst topography, 6) in any park or recreational area, wildlife management area or areas designated by any federal or state agency as critical habitat of any endangered species; or 7) over an active fault. Each prohibition is addressed independently below.

For the purposes of these prohibitions "new" shall mean any area not presently included in an existing Part A application approved by the Department

**1. 100-year Floodplain.** No new sanitary landfills shall be located in a 100-year floodplain. Please refer to Section III.F.2.a. of this guidance document for a discussion of floodplain identification procedures.

**2. Wetlands:**

(Note: Additional Guidance for wetlands legislation and required demonstrations can be found in Guidance Document 03-2005)

**a. General.** Pursuant to Code of Virginia §10.1-1408.5, effective July 1, 1999, the Department cannot issue permits to allow the siting of a sanitary landfill in a tidal wetland or in a nontidal wetland contiguous to a surface water body even if the applicant obtained a permit to fill the wetlands from the U.S. Army Corps of Engineers and/or DEQ. In addition, if the applicant has yet to receive Part A approval or obtain a solid waste permit, then the Department shall not issue the permit unless the waste disposal area is modified to exclude the tidal (or nontidal, adjacent) wetland area. Facilities may, potentially be sited in a wetland if the landfill meets the provisions for exclusion under §10.1-1408.5 (*see* Section III K 2 c “Exemptions” below.)

**b. Definitions.**

*Surface water* means all state waters that are not ground water as defined in Sec.62.1-255 of the Code of Virginia. *State waters* means all water, on the surface and under the ground, wholly or partially within or bordering the Commonwealth or within its jurisdiction, including wetlands.

*A wetland is defined under 9 VAC 20-80-10 to be equivalent to that defined under 33 CFR 328. §10.1-1408.5 covers both tidal wetlands and nontidal wetlands and for the application of the landfill siting per 10.1-1408.5 is larger than or equal to 2 acres in size and contiguous to any tidal wetland or surface water body. The term wetland, as applied by this special provision, means any tidal wetland or a nontidal wetland contiguous to any tidal wetland or surface water body and does not include isolated wetlands.*

*VWP regulations define “wetlands” as “means those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” The VWP program also regulates isolated wetlands.*

**c. Exemptions.** Pursuant to Code of Virginia §10.1-1408.5, the Department may allow the siting of a new sanitary landfill or the expansion of a sanitary landfill that would be sited in a tidal wetland or nontidal wetland contiguous to a surface water body if the applicant can provide a demonstration that the site meets the provisions for one of the following exemptions:

- (1) The first exemption is for an expansion of an existing sanitary landfill located in a city with a population between 41,000 and 52,500 when the owner or operator is an authority created pursuant to §15.2-5102 which has applied for a permit under § 404 of the federal Clean Water Act prior to January 1, 1989, and the owner or operator has received a permit under § 404 of the federal Clean Water Act and § 62.1-44.15:5 of the Code and complied with all other applicable federal and state environmental laws and regulations. In addition, construction of a new MSW landfill is allowed in any county with a population between 29,200 and 30,000 according to the 1990 United States Census.
- (2) A second exemption is for the expansion of a sanitary landfill if the following conditions are met: 1) the proposed landfill site is at least 100 feet from any surface water body and at least one mile from any tidal wetland and 2) the director determines, based on the existing condition of the wetlands system, including but not limited to, sedimentation, toxicity, acidification, nitrification, vegetation, and proximity to existing permitted waste disposal areas, roads or other structures, that the construction or restoration of a wetland system in

another location in accordance with a Virginia Water Protection Permit approved by the State Water Control Board would provide higher quality wetlands, and 3) the permit requires a minimum two to one wetlands mitigation ratio.

(3) The third and final exemption states that the provisions of §10.1-1408.5 of the Code of Virginia do not apply to landfills which impact less than 2 acres of nontidal wetlands. The 2 acres is total area of nontidal wetlands for the facility; not the amount of wetlands that could be impacted for each expansion.

Guidance on demonstrations for each of the exemptions can be found in DEQ Guidance 03-2005 Guidance for the implementation of HB2192 regarding wetlands siting.

### **3. Public Water Supplies and Reservoirs.**

(Note: Additional Guidance for landfill siting in the vicinity of public water supplies and reservoirs legislation can be found in Guidance Document 04-2005)

**a. General.** Pursuant to the requirements of Code of Virginia §10.1-1408.4 B 3, no new sanitary landfill shall be located no closer than 1 mile of any existing surface water or groundwater public water supply intake or reservoir. In order to locate a sanitary landfill between one mile and three miles of an existing public water supply or reservoir, the following information must be provided:

- Information demonstrating that the facility is upgradient or downgradient of the water supply of reservoir. If the landfill is downgradient of the water supply or reservoir, the siting restrictions do not apply;
- Information demonstrating the facility meets the requirements for alternative liner systems;
- A liner design that includes the installation of two synthetic liners with leachate collection systems installed above and below the uppermost (primary) liner.
- A groundwater monitoring plan which provides for quarterly groundwater monitoring of all groundwater wells between the landfill and the water supply intake. The groundwater monitoring plan must also provide for the results of the quarterly monitoring events to be reported to the department within 15 days of the facility owner or operator receiving the results of the laboratory analysis.
- Other information that may be deemed necessary by the director of DEQ in consultation with the Commissioner of Health to protect human health and the environment.

**b. Definitions.** For purposes of this guidance, a "public water supply" shall be as defined in the Virginia Department of Health regulations (i.e., serve more than 25 people and have at least fifteen service connections).

**c. Demonstration. Identification of the 3 mile buffer and upgradient.** The

regulations require all existing surface or groundwater public water supply intakes (surface water or wellhead) or reservoirs (mean HWL), that have a PWS-ID, within 3 miles [measured straight-line horizontal on scale map] of the perimeter of the proposed property for a new sanitary landfill to be identified in the regional map [9 VAC 20-80-510 C, SI-1, III.D.2 ]. The information can be based on:

- A review of available maps, logs, and reports;
- An aerial reconnaissance of an area within a five mile radius of the site, including aerial photo analysis;
- A reconnaissance based on walking portions of the area to verify locations of wells and intakes; and
- The Virginia Department of Health may be contacted to provide all reservoirs used to collect water for a public water supply intake point, and
- All Public Water Supplies that are registered with EPA and the Virginia Department of Health and have a PWS-ID number. These records are maintained at the Virginia Department of Health. A listing of the waters supply's owners are available at: [http://www.vdh.state.va.us/dw/ListingWaterworks\\_Owners\\_ww.asp](http://www.vdh.state.va.us/dw/ListingWaterworks_Owners_ww.asp)
- Exact locations of Public Water Supplies can be obtained from the Director of Technical Services of the Virginia Department of Health.

Determine, from the maps, if the landfill is upgradient or downgradient of each water supply or reservoir.

**(1) Criteria for Directors Determination between 1 and 3 miles of a public water supply or reservoir**

**(a) Groundwater** - From the distance and gradient determination in section 3 A c above, a further clarification of the gradient issue is needed to determine the true gradient. If the true gradient is downward from the landfill to the public water supply intake or reservoir, controls will have to be implemented at the proposed landfill. Determinations of a hydrogeologic connection between the landfill and the water supply or reservoir will not be required. The potential scope of the hydrogeological characterization to determine a hydraulic connection is complex, expensive and not practical, i.e. potentially significant numbers of soil borings in a 3-mile distance. Therefore the following public water supply protection is required for each new proposed landfill:

- **Public Water Systems with the classification of Community, Non-Community, and Nontransient Noncommunity** - For each water system identified in 3 A c of this guidance, the owner of the proposed landfill shall notify each owner of the water system in accordance with 9 VAC 20-80-500.B.5 and 9 VAC 20-80-510.I. The notification shall include a summary of

the relative site locations, the potential for adverse impact and the request for well construction information from the water system owner. Well construction information is alternatively available from the VDH. The owner of the proposed landfill shall address any comments from the owner of the water system and the Part A permit application shall explain how comments were addressed.

- **Public Water Systems with the classification of Community and Non-Community** - All Part A permit applications shall address the following:
    - new landfills must establish Groundwater Protection Standards in accordance with 9 VAC 20-80-300.B.3 and §10.1-1408.4 prior to new permit issuance; and
    - the monitoring wells must be sampled quarterly in accordance with 9 VAC 20-80-300.B.1.e; and
    - the maximum horizontal well spacing for downgradient monitoring wells must be in accordance with 9 VAC 20-80-300.A.3.f or 250 feet, whichever is less; and
    - the standard Part A approval condition that is attached, must be included with all staff recommendations of Part A application approval where the facility is "New". Changes to the standard condition must be approved by the Director of Waste Permitting in advance of the application recommendation and the recommended wording may be by submitted and approved by email.
  - Proposed new landfills are not upgradient of a water supply or reservoir if the lowest portion of the proposed landfill property is at an elevation lower than the property elevation (MSL) closest to the surface water intake point or ground water intake point or mean high water elevation at the reservoir; and the water level elevation in the groundwater source for the water supply is higher than water level elevation of the monitoring well for the proposed landfill. The amount of hydrogeological information needed for any other gradient determination can not reasonably be acquired in order to make conclusive proof that the protection of public health and the environment is assured.
- (2) Groundwater Time of Travel** - Other information that may be deemed necessary by the Director of DEQ in consultation with the Commissioner of Health to protect human health and the environment may be required.
- **Time of Travel** - At a minimum, information will be provided on the groundwater time of travel between the landfill and a public water supply intake or reservoir. Time of travel calculations will estimate the time it would take for groundwater discharges from the landfill to reach any existing public

water supply intake or reservoir. The following information must be supplied for the time of travel calculations:

- **Hydraulic Conductivity and Gradient** - The hydraulic conductivity and the gradient between the sanitary landfill and the public water supply or reservoir must be characterized in order to perform the required calculation.
- **Investigation** - Site-specific environmental investigation of the property based on borings and wells installed across the site should be included.
- **Field Data** - Available information and field testing data may be utilized, as appropriate.
- **Report** - A certified report prepared by a qualified groundwater scientist that describes soils, geology, meteorology and hydrology between the proposed site and the public water supply.
- **Maps** - Hydrogeologic maps and field data may be used to determine the permeability of the aquifer; however, the calculation for the time of travel must be based, at least in part, on actual measured values.
- **Slug Test** - A pumping test or slug test must be completed within 1000' of the public water supply, as defined by this guidance, and within the major geologic formations that exist between the proposed facility and the water supply system.
- **Depth** - The depth of the testing must be compatible with the pumping depth of a public water supply system extraction well(s) or the bottom elevation of a reservoir or surface water intake.
- **Gradient** - The gradient between the landfill and the public water supply or reservoir should be calculated by using the landfill base grade elevation and the elevation (MSL) of the public water supply intake or the mean water elevation of the reservoir.
- **Karst** - In geographic areas where karst development is known or suspected and, based in the geologic formations between the sanitary landfill and the public water supply intake or reservoir, the hydraulic conductivity of karstic aquifers must be considered to be extremely high. The groundwater time of travel calculation shall be modified as noted below to treat any karstic aquifer as being immediately connected to a public water supply intake or reservoir.

**(3) Liner Design** - All new sanitary landfills with new disposal cells or phases must have a double liner and a monitoring zone between the two liners that meets the minimum liner design as follows:

- Base preparation to protect the liner by preventing liner failure through subsidence or structural failure of the liner system.
- A lower liner consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than  $1 \times 10^{-7}$  cm/sec.
- An upper component consisting of a minimum 30-mil flexible membrane liner (FML). If high-density polyethylene (HDPE) is used as an FML, it shall be at

least 60-mil thick. The FML component shall be:

- Installed in direct and uniform contact with the compacted soil liner;
- Placed in accordance with an approved construction quality control/quality assurance program submitted with the design plans; and
- Placed with a minimum of two percent slope for leachate drainage, and
- A witness or monitoring zone placed above the lower liner consisting of a minimum of single geonet layer or a 12-inch thick drainage layer composed of material with a hydraulic conductivity of  $1 \times 10^{-3}$  cm/sec or greater with a network of perforated pipe for the aggregate option only, the witness zone must be monitored in accordance with the permit and the liquid must be managed as leachate; and
- An upper liner consisting of at least a minimum 30-mil flexible membrane liner (FML). If high-density polyethylene (HDPE) is used as an FML, it shall be at least 60-mil thick;
- A leachate collection system above the upper liner that meets the provisions of 9 VAC 20-80-290;
- The liner must be placed with a minimum of two- percent slope for leachate drainage.

The liner described above meets the provisions of the legislation and would not require an alternate liner design approval as required in 9 VAC 20-80-780, because the lower composite liner meets the provisions of 9 VAC 20-80-250 B 9 (Subtitle D). Any alternative to the above design would be required to have an alternate line design approval according to the provisions of 9 VAC 20-80-780 and meet the provision of the legislation including the requirement for two synthetic liners with a leachate collection system above and below the primary liner.

**d. Departmental Site Review.** Other information that may be deemed necessary by the director of DEQ in consultation with the Commissioner of Health to protect human health and the environment may be required.

At a minimum, information will be provided on the time of travel between the landfill and a public water supply intake or reservoir. Time of travel calculations will be provided which estimate the time it would take for groundwater discharges from the landfill to reach a public water supply or reservoir. The hydraulic conductivity and the gradient between the landfill and the public water supply or reservoir must be characterized in order to perform the required calculation. Hydrogeologic maps and field data may be used to determine the permeability of the aquifer.

**e. Departmental Site Review.** If the Department concludes that any public water



supply intakes or reservoirs are closer than 1 mile of the proposed new sanitary landfill, the site cannot be approved. Engineering modification are not permitted to allow the applicant to overcome site limitations related to these prohibitions.

#### **4. Dam Failures.**

**a. General.** [9 VAC 20-80-250.A.9. Pursuant to the requirements of Code of Virginia §10.1-1408.3 B.5, no new sanitary landfill shall be located in any area vulnerable to flooding from dam failures.

**b. Definitions.** For purposes of this guidance, a "dam" shall be defined as any impounding structure used to collect and contain water.

**c. Demonstration.** The application shall include an assessment designed to determine if the new sanitary landfill is located in any area vulnerable to flooding due to dam failure (i.e., located downstream of any impounding structures). The assessment should include a review of any USGS maps or local maps where impounding structures would be identified. If the proposed sanitary landfill is located downstream of an impounding structure, the Virginia Division of Dam Safety and the Local Emergency Services Coordinator should be contacted to determine if a dam breach contingency plan has been developed for the identified impounding structure. If a contingency plan has not been previously prepared, the application shall provide a dam breach inundation study to determine if the proposed landfill is vulnerable to flooding as a result of dam failure.

**d. Departmental Site Review.** If the Department concludes that the proposed new sanitary landfill is in an area vulnerable to flooding due to dam failure, the site cannot be approved. Engineering modification are not permitted to allow the applicant to overcome site limitations related to these prohibitions.

#### **5. Sinkholes and Solution Caverns**

**a. General.** [9 VAC 20-80-250.A.9] Pursuant to the requirements of Code of Virginia §10.1-1408.4.B.5, no sanitary landfill shall be sited over a sinkhole or less than 100 feet above a solution cavern associated with karst topography as measured from base grade. The following discussion assumes the site is in karst terrain.

**b. Definitions.** For purposes of this requirement, a *Sinkhole* means a depression formed by sinking or collapse of the land surface where solution of the underlying rocks has

formed cavities or other openings. Sinkholes may not have a readily visible surface expression. Furthermore, a change in surface or subsurface drainage patterns, such as in landfill site development, may increase the development of sinkholes or may reactivate older sinkholes that have stabilized. A sinkhole collapse may be sudden or non-sudden. In areas of thick soil overburden, the land surface may gradually subside, forming a solution sink, which is a gentle swale in the land surface. In areas of thin to no soil, a collapse sink may suddenly occur. For purposes of this Code, *solution cavern* means a large solution cavity with a minimum volume of 24 cubic feet, and a minimum thickness of 1-foot in the vertical plane. It is generally continuous in areal extent and depth. It may be near the surface or far below the top of rock.

**c. Demonstration-Sinkholes.** If it is determined that the proposed site is in karst terrain, then a karst inventory should be performed. A karst inventory catalogs all karst features such as sinkholes, losing streams, pinnacles, springs, etc. to determine the potential for a sinkhole occurrence within the footprint of the site, the applicant should do a literature search and a ground-truth survey. Sources of information may include but are not limited to:

- a. USGS 7.5 minute quadrangle maps and geologic maps;
- b. USDA Soils Survey Maps;
- c. Aerial Photography;
- d. Boring records from private or government firms;
- e. Local governing bodies;
- f. State and Federal Agencies; and
- g. Local residents.

A thorough literature search must be performed to identify the location of visible or hidden sinkholes prior to walking the site. A ground truth survey should be performed depending upon the size of the site. If a sinkhole exists within the limits of waste disposal or under proposed foundations of erosion and sedimentation structures, buildings, roadways, or similar features, then the areas with sinkhole potential must be removed from consideration.

**d. Demonstration- Solution Cavern.** If, during the site investigation, a vertical cavity is encountered less than 100 feet below anticipated base grade, and the cavity is greater than one foot in height, it shall be assumed that a solution cavern exists unless a demonstration is made to the contrary. The applicant must demonstrate to the satisfaction of the Department that the cavity is not a solution cavern meeting the

definition above. The applicant may use any standard subsurface exploration technique in the demonstration. The sinkhole and cavern prohibitions shall be a chapter of the Part A application and shall include:

1. Summary and introduction of the karst features;
2. A map showing the relationship of the landfill to the surrounding karst terrain. It shall show major karst features within a 5 mile radius of the site. A near vicinity map at a scale of 1 inch to 200 feet showing the boring locations, site karst features, and proposed locations of the various landfill boundaries and structures. Both maps may be included in other chapters of the Part A as required by other sections of the Code and VSWMR but a clear cross reference must be noted;
3. A discussion of the karst inventory such as methods, procedures, limitations, sources, etc.;
4. Sinkholes and potential sinkhole development;
5. Subsurface exploration program;
6. Discussion of any sink features encountered;
7. Demonstration containing the following elements:
  - a. Discussion of cavities encountered,
  - b. Discussion of how to disprove it is not a solution cavern, and
  - c. Techniques involved, limitations, assumptions, and measurements.
8. Conclusions;
9. Appendices containing boring logs and other subsurface data; and
- 10 References and bibliography.

**e. Departmental Site Review.** If the Department concludes that a sinkhole or solution cavern less than 100 feet below the landfill exists, then that portion of the site cannot be approved. Engineering modification are not permitted to allow the applicant to overcome site limitations related to these prohibitions. The applicant may submit more information prior to final Part A review to bolster the demonstration.

**6.** No new sanitary landfill shall be located in any park or recreational area, wildlife management area or areas designated by any federal or state agency as critical habitat of any endangered species. Copies of all correspondence to and from other state and federal agencies shall be included in the environmental impact statement required in Section H of this guidance.

## 7. Active Faults [§ 250.A.5., 9 VAC 20-80-10].

**a. General.** Pursuant to the requirements of Code of Virginia §10.1-1408.3 B.5, no new sanitary landfill shall be sited over an active fault

**b. Definitions.** For purposes of this guidance, an "active fault" shall be defined as a fault plane that has experienced movement during the Holocene Epoch.

**c. Demonstration.** Site fault characterization is necessary to determine whether or not a site is located over the plane of a fault which has had movement during the Holocene Epoch. An investigation would include obtaining information on any lineaments that suggest the presence of any faults within a one-mile radius of the site and the absence of a fault or faults that have had displacement in the Holocene Epoch whose fault plane could be projected beneath the proposed sanitary landfill. The information could be based on:

- A review of available maps, logs, reports, scientific literature, or insurance claim reports;
- An aerial reconnaissance of an area within a five mile radius of the site, including aerial photo analysis; and
- A reconnaissance based on walking portions of the area within one mile from the proposed perimeter of the new sanitary landfill.

The U.S. Geological Survey (USGS) map series identifying the location of Holocene Epoch faults in the United States<sup>9</sup> can be used by an applicant to determine the location of such fault zones. High altitude, high resolution aerial photographs with stereo coverage are a useful remote sensing aid for delineating fault traces and structural lineaments. This series of aerial photography provides coverage over most of the United States and is available through the U.S. Geologic Survey.<sup>10</sup> If the information indicates a fault or faults within one mile of the proposed perimeter of the new sanitary landfill (at a minimum, investigations should be conducted to determine the presence or absence of any faults that have had displacement during the Holocene Epoch. Suggested investigative tasks are:

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<sup>9</sup> USGS, *Preliminary Young Fault Maps, MF916*, Books and Open File Section, Branch Distribution, Box 25046, Federal Center, Denver, CO 80225.

<sup>10</sup> U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198

- Subsurface exploration, including drilling and trenching to locate fault zones and evidence of faulting;
- Trenching perpendicular to any fault or lineaments;
- Determination of the age of any displacements; and
- Construction of supporting maps and other analyses.

**d. Departmental Site Review.** If it has been demonstrated that the proposed new sanitary landfill is over an active fault, then the site cannot be approved. Engineering modification are not permitted to allow the applicant to overcome site limitations related to these prohibitions.

**IV. PART B APPLICATION.** [ §§ 500.D.1., and 520., 530., or 540., 9 VAC 20-80-10] Upon the receipt from the Department of the notice of approval of the Part A application, the applicant shall submit three copies of the documentation supporting the Part B application. The required Part B documentation varies depending on the type of the proposed solid waste management facility. Specific instructions given in the remaining Submission Instructions supplement the requirements shown below which are general in nature.

**A. Format.** The Part B Application should be submitted in a series of modules as follows:

**Module I General Conditions.** This section is prepared by the department and includes general permit language as well as permit conditions associated specific to the facility.

**Module II Operations.** This section is prepared by the applicant. The section will address the requirements for operation based on the type of facility. rthe application will include the following elements.

**Operations Manual.** [ § 520.C., 530.D., or 540.C., 9 VAC 20-80-10] The operations manual must provide the detailed procedures by which the operator shall implement the design plans and specifications. See *Submission Instructions No.8*.

Attachments to the Operations Manual include the following

- 1. Safety Plan**

## **2. Control Program for Unauthorized Waste**

**3. Emergency (Contingency) Plan.** [§ 530.E., 9 VAC 20-80-10] Submit an emergency plan which delineates procedures for responding to fire, explosions or any unplanned sudden or non-sudden releases as a part of the application. For greater detail see *Submission Instructions No. 7.*

**Module III, IV, V, VI, VII, VIII, or IX Design.** This section is prepared by the applicant and includes the design information appropriate for the type of facility. Include the following elements.

**Design Report.** [§ 520.B., 530.B., or 540.B., 9 VAC 20-80-10] Submit a design report which explains and supplements the design plans and shows all the design calculations. The detailed instructions are shown in *Submission Instructions No. 2, 3, or 4*, and, if applicable, *Submission Instructions No. 5, 11, or 12.*

Attachments to the design report will include the following

**1. Design Plans.** [§ 520.A.1., 530.A., or 540.A., 9 VAC 20-80-10] Design plans must be prepared by a firm registered to practice professional engineering in the Commonwealth and certified by a licensed professional engineer. *Submission Instructions No. 2, 3, or 4* give the detailed instructions.

**2. Part A Approval.** A copy of the Part A approval with any associated plans and maps.

**3. Gas Management Plan**

**4. Technical Specifications**

**5. Construction Quality Assurance Plan**

**Module X (Detection/Phase I) and Module XI (Assessment/Phase II) Groundwater.** This section is prepared by the applicant. The section will address the requirements of the

regulations related to groundwater monitoring. Detailed Instructions are provided in *Submission Instructions No.5,11 or 12* as applicable.

**Module XII and XIII Closure and Post Closure Care.** This section is prepared by the applicant. The section discusses the requirements of the regulations related to closure and post-closure care. Detailed instructions are provided in *Submission Instructions No. 6*.

**Closure Plan.** [§§ 520.A.2., 530.F., or 540.D., and 7.8., 9 VAC 20-80-10] Furnish a closure plan for all facilities as a part of the application. *Submission Instructions No. 6* give the detailed instructions.

#### **Module XIV Schedule of Compliance for Corrective Action**

#### **Module XV Leachate Handling**

**B. Permit Application Fee.** [§ 60., 9 VAC 20-80-90]. The application shall be accompanied by a proper fee. Applications without proper fees will be returned to the applicant.

**C. Financial Assurance Documentation.** [§§ 3.3., 3.4., 3.5., and 3.6. of Financial Assurance Regulations of Solid Waste Facilities, 9 VAC 20-70-10; § 500.D.1. of Virginia Solid Waste Management Regulations, 9 VAC 20-80-10] All applications except for those from State or Federal Agencies shall include demonstration of compliance with the regulations. Until the closure plans are approved and a draft permit has been prepared, the applicant must provide evidence of commitment to provide the financial assurance as required by the regulations. For detailed instructions see *Submission Instructions No. 9*.

**D. Waste Supply Analysis.** [§ 360.C.9. or 530.C., 9 VAC 20-80-10] Applications for materials or energy recovery and incineration facilities must contain a waste supply analysis program to characterize the quantity and composition of the solid waste in the service area.

For detailed instructions see *Submission Instructions No. 10*.

**V. PERMIT ISSUANCE.** [§ 500.E., 9 VAC 20-80-10] Upon completion of the technical evaluation of the permit application, the Department will render a tentative decision either to issue or deny the permit. With a decision to recommend issuance of the permit, the Department will prepare a draft permit and publish a notice to that effect in a newspaper of the general circulation in the area where facility is to be located. The notice will contain the date and place for a scheduled public hearing. Upon completion of the public comment period, the Director will decide whether to issue the final permit with or without modifications or to deny the permit. The applicant will be notified in writing of the decision.



APPENDIX 1-1  
LETTER TO INDIVIDUAL COUNTIES OR TOWNS

*date*

*Contact Name*

*Locality Administrator*

*Address*

*Town, VA ZIP*

Dear *Contact name*:

*Applicant* plans to construct and operate a municipal solid waste management facility in *County/ City/ Town / Place*. Pursuant to Virginia Code 1408.1.B.6, you may reserve disposal capacity in this landfill up to the requirements specified in your approved solid waste management plan. By signing the agreement below, *the applicant* agrees to guarantee the facility will reserve the requested disposal capacity for *the locality*. The applicant and locality must sign a contract that stipulates the conditions of the agreement. By signing the denial statement, *the locality* agrees that it does not wish to reserve disposal capacity. If the acceptance agreement is not returned within 60 days from the date of this letter, it will be assumed that *the locality* has refused the offer to reserve disposal capacity.

Sincerely,

*Contact Name*

*Applicant*

*Address*

*Town, VA ZIP*

APPENDIX 1-2  
LETTER TO DISTRICT PLANNING DISTRICT COMMISSIONS

*date*

*Contact Name*

Executive Director

District \_\_\_\_-*Planning District Name*

*Address*

*Town, VA ZIP*

Dear *Contact name*:

*Applicant* plans to construct and operate a municipal solid waste management facility in *County/ City/ Town / Place*. Pursuant to Virginia Code 1408.1.B.6, the applicant is required to contact the localities in the Commonwealth to notify them that they may reserve disposal capacity in this landfill up to the requirements specified in the applicable solid waste management plan. *Applicant* respectfully requests that you forward this letter to all solid waste entities or authorities for the counties, cities and towns within your district.

To the locality, *applicant* is offering you the opportunity to reserve disposal capacity in the proposed landfill up to the requirements specified in the your solid waste management plan. If *the locality* signs the acceptance agreement, then *the applicant* agrees to guarantee the facility will reserve the requested disposal capacity for the *locality*. The applicant and locality must sign a contract that stipulates the conditions of the agreement. By signing the denial statement, *the locality* agrees that it does not wish to reserve disposal capacity. If the acceptance agreement is not returned within 60 days from the date of this letter, it will be assumed that *the locality* has refused the offer to reserve disposal capacity.

Sincerely,

*Contact Name*

*Applicant*

*Address*

*Town, VA ZIP*

APPENDIX 1-3  
AGREEMENT TO ACCEPT:

On behalf of \_\_\_\_\_, the undersigned hereby accepts the offer from \_\_\_\_\_ to reserve disposal capacity in the planned facility. The locality has fully investigated its future solid waste disposal needs and has concluded it requires \_\_\_\_\_ cubic yards of reserve capacity. The undersigned understands that by accepting this offer, *the locality* and the *applicant* must enter into a contract that stipulates the conditions of the agreement. The acceptance letter will constitute an enforceable agreement to guarantee future disposal capacity until a formal contract is signed.

Signed: \_\_\_\_\_ Date \_\_\_\_\_

Title and investing Authority \_\_\_\_\_

Contact Information \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

STATEMENT OF DENIAL

On behalf of \_\_\_\_\_, the undersigned declines the offer to reserve disposal capacity in the planned facility. The undersigned agrees that by signing this statement, the applicant has made a good faith effort to inform the locality of its right to reserve airspace and that the locality has fully investigated its solid waste disposal needs and believes the reserve airspace is not needed at this time.

Signed: \_\_\_\_\_ Date \_\_\_\_\_

Title and investing Authority

\_\_\_\_\_

Contact Information \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## APPLICANT CERTIFICATION

Pursuant to the requirements of the Code of Virginia §10.1-1408.1 the undersigned certifies that *the applicant* has contacted all localities in Virginia to offer to reserve disposal capacity per the respective solid waste management plans. Only those localities listed below have agreed to the offer. The total reserve disposal capacity for all of the localities on the list below is \_\_\_\_\_ cubic yards. By agreeing to this offer, the applicant guarantees to reserve the required capacity in the facility by entering into a contractual agreement with those localities.

Signed: \_\_\_\_\_ Date \_\_\_\_\_

Title and investing Authority \_\_\_\_\_

Contact Information \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

APPENDIX 1-4

**LIST OF LOCALITIES THAT HAVE ACCEPTED AGREEMENT.**

NAME	CAPACITY (cubic yards)

Subtotal	
Subtotal from other pages	
Grand total	

APPENDIX 1-5  
GEOTECHNICAL INVESTIGATORY TECHNIQUES

TASKS	TECHNIQUES	OUTPUTS
Definition of Subsurface Materials	<b>Survey of existing geologic information</b>	<b>Narrative description of geology</b>
	<b>Soil borings</b>	<b>Geologic cross sections</b>
	Rock coring	<b>Geologic or soil map (1' = 250')</b>
	Material tests (grain size analysis, standard penetration tests, etc.)	<b>Boring logs or coring logs</b>  Isopach maps 1" = 250')



	Geophysical well logs {point and lateral Resistivity or electromagnetic conductance, gamma ray, gamma density. caliper. etc.)	Structure contour maps of aquifer and confining layer (plan view)
	Surface geophysical surveys (D.C resistivity, E.M., Seismic)	Raw data and interpretative analysis of geophysical studies
	Hydraulic conductivity measurements of cores (unsaturated zone)	<b>Raw data and interpretative analysis of material tests</b>
	Aerial Photography (fracture test analysis)	
	Detailed lithologic and structural mapping of outcrops and trenches	
Identification Of groundwater flow paths	<b>Installation of piezometers; water level measurements at different depths and locations</b>	<b>Narrative description of groundwater with flow patterns</b>
	<b>Slug tests and pump tests</b>	<b>Water table or potentiometric maps (plan view) with flow lines (1' - 250")</b>
	Tracer studies	<b>Hydrologic cross sections</b>
	Estimates based on sieve analysis	Raw data and interpretative analysis of Slug tests, pump tests, and tracer studies
Identification of potential solution caverns	drilling equipment capable of obtaining continuous rock cores for a minimum of 100 feet below base grade	continuous rock core demonstrating that there are no voids greater than 1-foot in the vertical plane

NOTE:

Minimum techniques and corresponding Outputs that should be used to complete be geotechnical report in **bold** type face all others are

Recommended techniques and output.

## APPENDIX 1-6

### FACTORS INFLUENCING DENSITY OF BORINGS

FACTORS FOR REDUCED DENSITY	FACTORS FOR INCREASED DENSITY
Simple geology (i.e., horizontal, thick, homogeneous geologic strata that are continuous across site that are unfractured and are substantiated by regional geologic information)	Fracture zones encountered during drilling
Use of geophysical data to correlate well log data. Preferred methods: D.C. resistivity, seismic refraction, Seismic reflection, geophysical well logging	Suspected pinchout zones (i.e., discontinuous units across the site)
	Geologic formations that are tilted or folded
	Suspected zones of high permeability that would not be defined by drilling at large intervals
	Laterally transitional geologic units with irregular permeability (e.g., sedimentary facies changes)
	Areas with karst topography

## APPENDIX 1-7

### FIELD BORING LOG INFORMATION

#### General

Project Name

- ☐ Hole name/number
- ☐ Date started and finished
- ☐ Geologist's name
- ☐ Driller's name

Sheet number

- ☐ Hole location, map and elevation
- 

- ☐ Rig type, bit size or auger size
- ☐ Petrologic, lithologic classification scheme used (Wentworth, unified soil classification scheme)

#### Information Columns

- ☐ Depth
- ☐ Sample location/number
- ☐ Blow counts and advance rates
- ☐ Percent sample recovery
- ☐ Narrative description
- ☐ Depth to saturation

#### Narrative Description

---

Geologic Observations

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- ☐ Soil/rock type
  - ☐ Color and stain
  - ☐ Gross petrology
  - ☐ Friability
  - ☐ Moisture content
  - ☐ Degree of weathering
  - ☐ Presence of carbonate
  - ☐ Fractures
  - ☐ Solution cavities
  - ☐ Bedding
  - ☐ Discontinuities: ed. Foliation
  - ☐ Water-bearing zones
  - ☐ Formation strike and dip
  - ☐ Fossils
  - ☐ Deposition structures
  - ☐ Organic content
  - ☐ Odor
  - ☐ Suspected contaminants
-

. Drilling Observations		
<hr/>		
<input type="checkbox"/> Loss of Circulation	<input type="checkbox"/> Changes in drilling method or equipment	<input type="checkbox"/> Amounts and types of liquids used
<input type="checkbox"/> Advance rates	<input type="checkbox"/> Readings from detection equipment, if any	<input type="checkbox"/> Running sands
<input type="checkbox"/> Rig chatter	<input type="checkbox"/> Amount of water yield or loss during drilling at different times	<input type="checkbox"/> Caving/hole stability
<input type="checkbox"/> Water levels		
<input type="checkbox"/> Amount of Air used, air pressure		
<input type="checkbox"/> Drilling Difficulties		

. Other Remarks
<hr/>

- Equipment failures
- ☐ Possible contamination
- ☐ Deviations from drilling plan
- ☐ Weather

---

☐ Indicates items the applicant should record, at a minimum

## APPENDIX 1-8

### SUGGESTED LABORATORY METHODS

SAMPLE ORIGIN	PARAMETER	METHOD	DETERMINES
Geologic formation, unconsolidated sediments, consolidated sediments, solum	Hydraulic Conductivity	Falling head, static head tests	Hydraulic conductivity
	Size Fraction	Sieving (ASTM)	Hydraulic conductivity
		Settling Measurements (ASTM)	Hydraulic conductivity
	Sorting	Petrographic Analysis	Porosity
		Column Drawings	
	Specific yield	Centrifuge Tests	Porosity
	Specific retention	Petrographic analysis	Soil type, rock type
	Petrology/pedology  Mineralogy	X-ray diffraction	
		confining clay mineralogy/chemistry	Geochemistry, potential flow paths
		Petrographic analysis	
		Petrographic analysis	

	Bedding	ASTM	
	Laminations		Soil cohesiveness
	Atterberg limits		
Contaminated samples (e.g., soils producing higher than background organic readings)	Appropriate subset of Appendix 5-1 parameters	SW-846	Identity of contaminants

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## Locality Owned-Locality Operated Landfill

<b>NAME OF LOCALITY:</b>	
<b>NAME OF APPLICANT:</b>	<b>Contact Person:</b>
<b>APPLICANT'S MAILING ADDRESS:</b>	<b>LOCATION OF FACILITY</b> (DESCRIBE LOCATION AND ATTACH MAPS)
ANTICIPATED DAILY TRAVEL ROUTES AND TRAFFIC VOLUMES(MAP SHOWING ROUTES TO BE USED)	
ANTICIPATED DAILY DISPOSAL LIMIT  _____ tons/day	
ANTICIPATED SERVICE AREA (ATTACH MAPS IF NECESSARY)	





APPENDIX i-9

**HOST AGREEMENT CERTIFICATION**

<b>NAME OF LOCALITY:</b>	
<b>NAME OF APPLICANT:</b>	<b>CONTACT PERSON:</b>
<b>APPLICANT'S MAILING ADDRESS:</b>	<b>LOCATION OF FACILITY (DESCRIBE LOCATION AND ATTACH MAPS)</b>
<b>HOST AGREEMENT MUST CONTAIN THE FOLLOWING ITEMS:</b>	
Amount of Financial Compensation to Locality	Provide Amount of Compensation \$ _____
Provision to Pay Full Cost of One Full Time Employee of The Locality to Monitor And Inspect Transportation And Disposal Practices	Briefly Describe
Daily Travel Routes And Traffic Volumes	Attach Map Showing Routes to Be Used
Daily Disposal Limit	Provide Amount _____ tons/day
Anticipated Service area	Briefly Describe (ATTACH MAPS IF NECESSARY)

Provision to Split Air And Water Samples With Host Locality	Briefly Describe
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### **Certification**

PURSUANT to Section 10.1-1408.1.B.7 of the Code of Virginia (1950), as amended, certification is required from the governing body of the locality in which a new municipal solid waste landfill or expansion of an existing facility that a host agreement has been reached between the applicant and the governing body unless the local governing body is the applicant. For the purpose of the this certification, ☐host agreement☐ means any lease, contract, agreement of land use permit entered into or issued by the locality in which the landfill is situated which includes terms and conditions governing the operation of the landfill.

The undersigned certifies that the host agreement has been reached with the above referenced locality and that the host agreement contains, at a minimum, provisions for the above noted items,

**SIGNATURE OF AUTHORIZED REPRESENTATIVE:**

**TYPED OR PRINTED NAME:**

**TITLE:** \_\_\_\_\_ **DATE:**